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Inventor Name	City	State/Country
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1 [The elements of nature: interactive and realistic techniques](#)

Oliver Deussen, David S. Ebert, Ron Fedkiw, F. Kenton Musgrave, Przemyslaw Prusinkiewicz, Doug Roble, Jos Stam, Jerry Tessendorf
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press

Full text available: [pdf\(17.65 MB\)](#) Additional Information: [full citation](#), [abstract](#)

This updated course on simulating natural phenomena will cover the latest research and production techniques for simulating most of the elements of nature. The presenters will provide movie production, interactive simulation, and research perspectives on the difficult task of photorealistic modeling, rendering, and animation of natural phenomena. The course offers a nice balance of the latest interactive graphics hardware-based simulation techniques and the latest physics-based simulation techni ...

2 [Level set and PDE methods for computer graphics](#)

David Breen, Ron Fedkiw, Ken Museth, Stanley Osher, Guillermo Sapiro, Ross Whitaker
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press

Full text available: [pdf\(17.07 MB\)](#) Additional Information: [full citation](#), [abstract](#)

Level set methods, an important class of partial differential equation (PDE) methods, define dynamic surfaces implicitly as the level set (iso-surface) of a sampled, evolving nD function. The course begins with preparatory material that introduces the concept of using partial differential equations to solve problems in computer graphics, geometric modeling and computer vision. This will include the structure and behavior of several different types of differential equations, e.g. the level set eq ...

3 [GPGPU: general purpose computation on graphics hardware](#)

David Luebke, Mark Harris, Jens Krüger, Tim Purcell, Naga Govindaraju, Ian Buck, Cliff Woolley, Aaron Lefohn
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press

Full text available: [pdf\(63.03 MB\)](#) Additional Information: [full citation](#), [abstract](#)

The graphics processor (GPU) on today's commodity video cards has evolved into an

extremely powerful and flexible processor. The latest graphics architectures provide tremendous memory bandwidth and computational horsepower, with fully programmable vertex and pixel processing units that support vector operations up to full IEEE floating point precision. High level languages have emerged for graphics hardware, making this computational power accessible. Architecturally, GPUs are highly parallel s ...

4 A practical analytic model for daylight



A. J. Preetham, Peter Shirley, Brian Smits

July 1999 **Proceedings of the 26th annual conference on Computer graphics and interactive techniques**

Publisher: ACM Press/Addison-Wesley Publishing Co.

Full text available:  [pdf\(230.74 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: aerial perspective, illumination, skylight, sunlight

5 Modeling the effect of the atmosphere on light



R. Victor Klassen

July 1987 **ACM Transactions on Graphics (TOG)**, Volume 6 Issue 3

Publisher: ACM Press

Full text available:  [pdf\(2.16 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

The interaction of light with particles suspended in the air is the cause of some beautiful effects. Among these effects are the colors of the sunset, the blue of the sky, and the appearance of a scene in fog. A lighting model that takes into account the effects of scattering by suspended particles is presented. A method of computing the colors of the sun and sky, for any sun position above the horizon, is derived from the lighting model. The model is also suitable for rendering fog under g ...

6 Rendering and animation of gaseous phenomena by combining fast volume and scanline A-buffer techniques



D. S. Ebert, Richard E. Parent

September 1990 **ACM SIGGRAPH Computer Graphics , Proceedings of the 17th annual conference on Computer graphics and interactive techniques SIGGRAPH '90**, Volume 24 Issue 4

Publisher: ACM Press

Full text available:  [pdf\(8.65 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper describes a new technique that efficiently combines volume rendering and scanline a-buffer techniques. This technique is useful for combining all types of volume-rendered objects with scanline rendered objects and is especially useful for rendering scenes containing gaseous phenomena such as clouds, fog, and smoke. The rendering and animation of these phenomena has been a difficult problem in computer graphics. A new algorithm for realistically modeling and animating gaseous phenomena ...

7 Physically-based simulation: A survey of the modelling and rendering of the earth's atmosphere



Jaroslav Sloup

April 2002 **Proceedings of the 18th spring conference on Computer graphics**

Publisher: ACM Press

Full text available:  [pdf\(323.18 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

One of the extensively researched fields in today's computer graphics are techniques for

simulation and visualisation of various natural phenomena. This state of the art report is a survey of the methods for modelling and rendering of the cloudless Earth's atmosphere and related light effects. A physically based lighting model describing the light propagation through the atmosphere is presented. The model takes into account absorption and scattering by particles suspended in the atmosphere and ca ...

Keywords: atmospheric effects, light scattering, modelling of natural phenomena, photo-realistic image synthesis

8 Physically-based simulation of twilight phenomena



Jörg Haber, Marcus Magnor, Hans-Peter Seidel

October 2005 **ACM Transactions on Graphics (TOG)**, Volume 24 Issue 4

Publisher: ACM Press

Full text available:  pdf(7.64 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We present a physically-based approach to compute the colors of the sky during the twilight period before sunrise and after sunset. The simulation is based on the theory of light scattering by small particles. A realistic atmosphere model is assumed, consisting of air molecules, aerosols, and water. Air density, aerosols, and relative humidity vary with altitude. In addition, the aerosol component varies in composition and particle-size distribution. This allows us to realistically simulate twil ...

Keywords: 3D radiative transfer equation, Physics-based sky model, multiple scattering, refraction, twilight phenomena

9 On the modeling and control of industrial electrostatic precipitators



Carl C. Davis, Naim A. Kheir

December 1981 **Proceedings of the 13th conference on Winter simulation - Volume 2**

Publisher: IEEE Press

Full text available:  pdf(525.19 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper recognizes electrostatic precipitators (ESP) as the primary mechanism for the control of particulate emissions from such operations as in the cement, paper and power industries. Due to the ever increasing emission limitations placed on industry by the Environmental Protection Agency it becomes increasingly important that ESP's operate at peak efficiency. This means that the controllers which maintain the electrostatic effect must be designed for optimum performance. Design of ESP ...

10 Real-time shading



Marc Olano, Kurt Akeley, John C. Hart, Wolfgang Heidrich, Michael McCool, Jason L. Mitchell, Randi Rost

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press



Full text available:  pdf(7.39 MB) Additional Information: [full citation](#), [abstract](#)

Real-time procedural shading was once seen as a distant dream. When the first version of this course was offered four years ago, real-time shading was possible, but only with one-of-a-kind hardware or by combining the effects of tens to hundreds of rendering passes. Today, almost every new computer comes with graphics hardware capable of interactively executing shaders of thousands to tens of thousands of instructions. This course has been redesigned to address today's real-time shading capabili ...



11

Projectors: advanced graphics and vision techniques





-  Ramesh Raskar
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**
Publisher: ACM Press
Full text available:  [pdf\(6.53 MB\)](#) Additional Information: [full citation](#)

12 Real-time volume graphics

-  Klaus Engel, Markus Hadwiger, Joe M. Kniss, Aaron E. Lefohn, Christof Rezk Salama, Daniel Weiskopf
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**
Publisher: ACM Press
Full text available:  [pdf\(7.63 MB\)](#) Additional Information: [full citation](#), [abstract](#)



The tremendous evolution of programmable graphics hardware has made high-quality real-time volume graphics a reality. In addition to the traditional application of rendering volume data in scientific visualization, the interest in applying these techniques for real-time rendering of atmospheric phenomena and participating media such as fire, smoke, and clouds is growing rapidly. This course covers both applications in scientific visualization, e.g., medical volume data, and real-time rendering, ...

13 Transparency & translucency: A practical analytic single scattering model for real time rendering

-  Bo Sun, Ravi Ramamoorthi, Srinivasa G. Narasimhan, Shree K. Nayar
July 2005 **ACM Transactions on Graphics (TOG)**, Volume 24 Issue 3
Publisher: ACM Press
Full text available:  [pdf\(914.21 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)


We consider real-time rendering of scenes in participating media, capturing the effects of light scattering in fog, mist and haze. While a number of sophisticated approaches based on Monte Carlo and finite element simulation have been developed, those methods do not work at interactive rates. The most common real-time methods are essentially simple variants of the OpenGL fog model. While easy to use and specify, that model excludes many important qualitative effects like glows around light source ...


14 High dynamic range imaging

-  Paul Debevec, Erik Reinhard, Greg Ward, Sumanta Pattanaik
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**
Publisher: ACM Press
Full text available:  [pdf\(20.22 MB\)](#) Additional Information: [full citation](#), [abstract](#)

Current display devices can display only a limited range of contrast and colors, which is one of the main reasons that most image acquisition, processing, and display techniques use no more than eight bits per color channel. This course outlines recent advances in high-dynamic-range imaging, from capture to display, that remove this restriction, thereby enabling images to represent the color gamut and dynamic range of the original scene rather than the limited subspace imposed by current monitor ...

15 A practical guide to global illumination using ray tracing and photon mapping

-  Henrik Wann Jensen
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**
Publisher: ACM Press
Full text available: Additional Information:

 [pdf\(697.07 KB\)](#)
[full citation](#), [abstract](#)

This course serves as a practical guide to ray tracing and photon mapping. The notes are mostly aimed at readers familiar with ray tracing, who would like to add an efficient implementation of photon mapping to an existing ray tracer. The course itself also includes a description of the ray tracing algorithm. There are many reasons to augment a ray tracer with photon maps. Photon maps makes it possible to efficiently compute global illumination including caustics, diffuse color bleeding, and part ...


16 [Visualizing geospatial data](#)



Theresa Marie Rhyne, Alan MacEachern, Theresa-Marie Rhyne

August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press

Full text available:  [pdf\(13.99 MB\)](#) Additional Information: [full citation](#), [abstract](#)

This course reviews concepts and highlights new directions in GeoVisualization. We review four levels of integrating geospatial data and geographic information systems (GIS) with scientific and information visualization (VIS) methods. These include:• Rudimentary: minimal data sharing between the GIS and Vis systems• Operational: consistency of geospatial data• Functional: transparent communication between the GIS and Vis systems• Merged: one comprehensive toolkit environmentW ...

17 [Sensor networks: Performance measurements of motes sensor networks](#)



G. Anastasi, A. Falchi, A. Passarella, M. Conti, E. Gregori

October 2004 **Proceedings of the 7th ACM international symposium on Modeling, analysis and simulation of wireless and mobile systems**

Publisher: ACM Press

Full text available:  [pdf\(334.52 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper we investigate the performance of mica2 and mica2dot Berkeley motes by means of an extensive experimental analysis. This study is aimed at analyzing the main elements that characterize the performance of a sensor network, e.g., power consumption in different operating conditions, impact of weather conditions, interference between neighboring nodes, etc. Even if the analysis is related to a specific technology it provides some general useful information. Specifically, we found that ...

Keywords: mica motes, sensor networks

18 [Semantic database modeling: survey, applications, and research issues](#)



Richard Hull, Roger King

September 1987 **ACM Computing Surveys (CSUR)**, Volume 19 Issue 3

Publisher: ACM Press

Full text available:  [pdf\(5.42 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Most common database management systems represent information in a simple record-based format. Semantic modeling provides richer data structuring capabilities for database applications. In particular, research in this area has articulated a number of constructs that provide mechanisms for representing structurally complex interrelations among data typically arising in commercial applications. In general terms, semantic modeling complements work on knowledge representation (in artificial int ...

19 [Performance and reliability analysis of relevance filtering for scalable distributed interactive simulation](#)




Mostafa A. Bassiouni, Ming-Hsing Chiu, Margaret Loper, Michael Garnsey, Jim Williams

July 1997 **ACM Transactions on Modeling and Computer Simulation (TOMACS)**, Volume

7 Issue 3

Publisher: ACM Press

Full text available:  pdf(499.11 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Achieving the real-time linkage among multiple, geographically-distant, local area networks that support distributed interactive simulation (DIS) requires tremendous bandwidth and communication resources. Today, meeting the bandwidth and communication requirements of DIS is one of the major challenges facing the design and implementation of large scale DIS training exercises. In this article, we discuss the DIS scalability problem, briefly overview the major bandwidth reduction techniques c ...

Keywords: bandwidth reduction, distributed interactive simulation, real-time protocols, scalable algorithms

20 [Controllable smoke animation with guiding objects](#)



Lin Shi, Yizhou Yu

January 2005 **ACM Transactions on Graphics (TOG)**, Volume 24 Issue 1

Publisher: ACM Press

Full text available:  pdf(246.85 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This article addresses the problem of controlling the density and dynamics of smoke (a gas phenomenon) so that the synthetic appearance of the smoke (gas) resembles a still or moving object. Both the smoke region and the target object are represented as implicit functions. As a part of the target implicit function, a shape transformation is generated between an initial smoke region and the target object. In order to match the smoke surface with the target surface, we impose carefully designed ...

Keywords: Constrained animation, fluid simulation, implicit functions, level sets, shape matching, shape transformations, velocity constraints

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